

# Well Stimulation in California: Senate Bill 4 (Pavley), Overview of Regulation, and California's Experience with Hydraulic Fracturing



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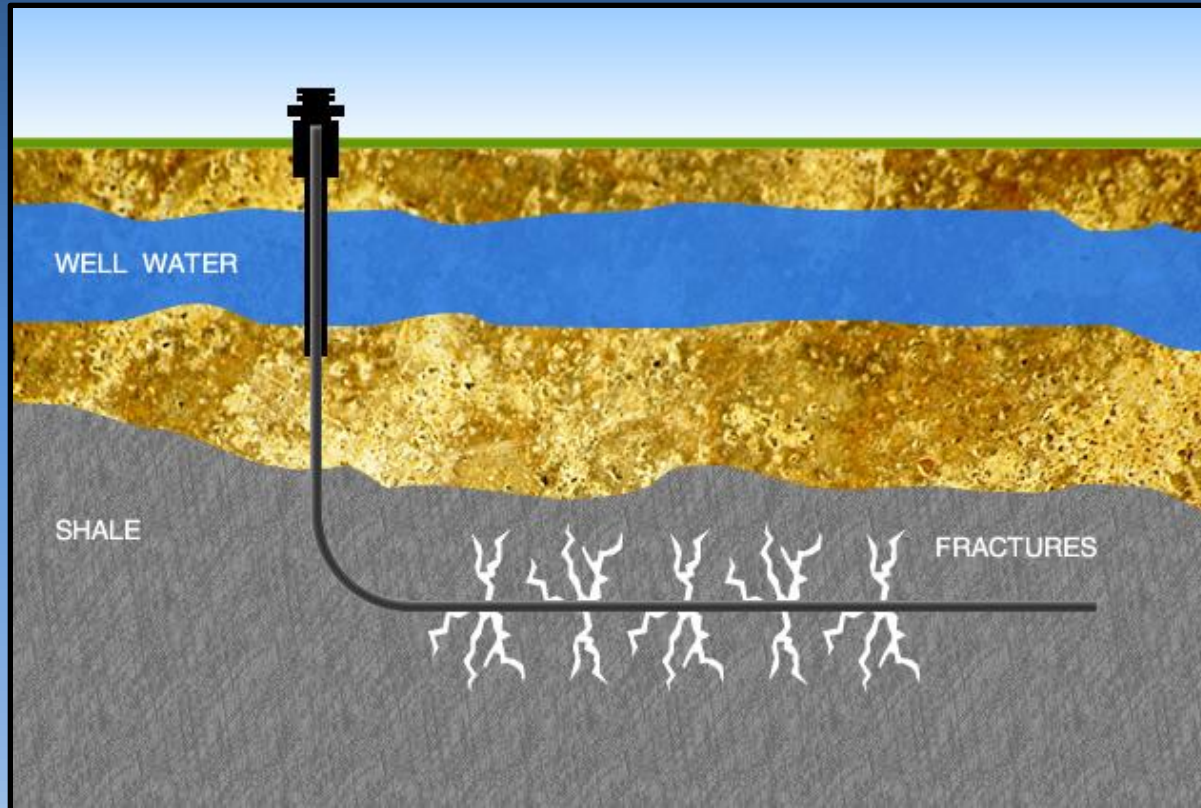
# Overview

- What is Well Stimulation
  - Focus on Hydraulic Fracturing
- California and Other States'/Regions' Experience
- Senate Bill 4 (Pavley)



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# What is Hydraulic Fracturing ?



- Increase permeability of oil-/gas-bearing formations
- Use of water, proppant, and chemicals to open fissures to allow oil/gas to flow to well
- Recent development? Combination of multi-stage HF in long, horizontal formation
- “Tight” shales or other types of formations require HF

Source: <http://today.uconn.edu/blog/2011/12/fracking-%E2%80%93-good-news-or-bad-for-america%E2%80%99s-energy-needs/>



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# Land Use Impacts



Source: [www.hittinghome.org](http://www.hittinghome.org)

## North Dakota -- Before and After



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# Land Use Impacts

Existing California  
Oilfield  
Operations, Lost  
Hills Field



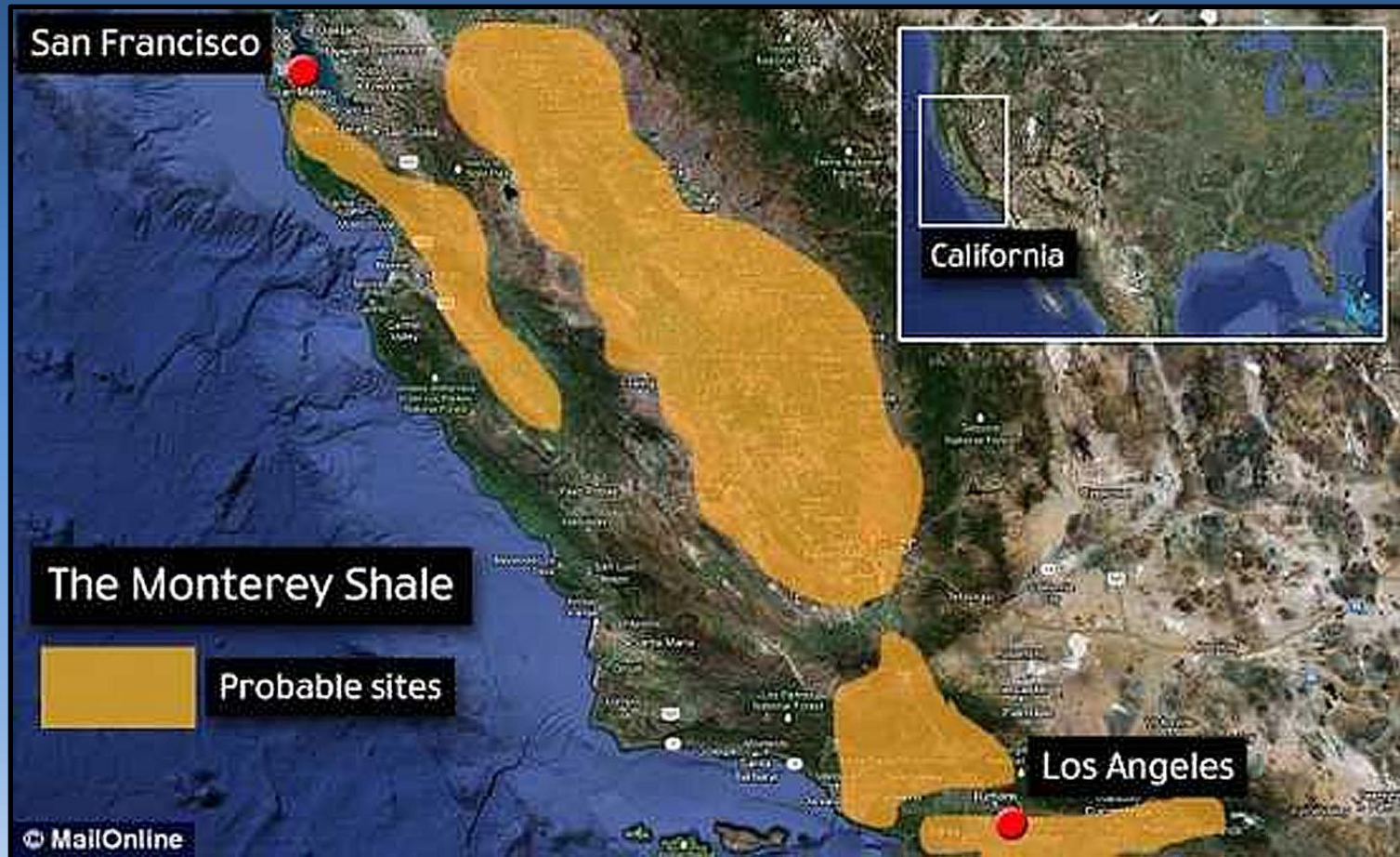
Source: [www.aeraenergy.com](http://www.aeraenergy.com)



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# The Monterey Shale?

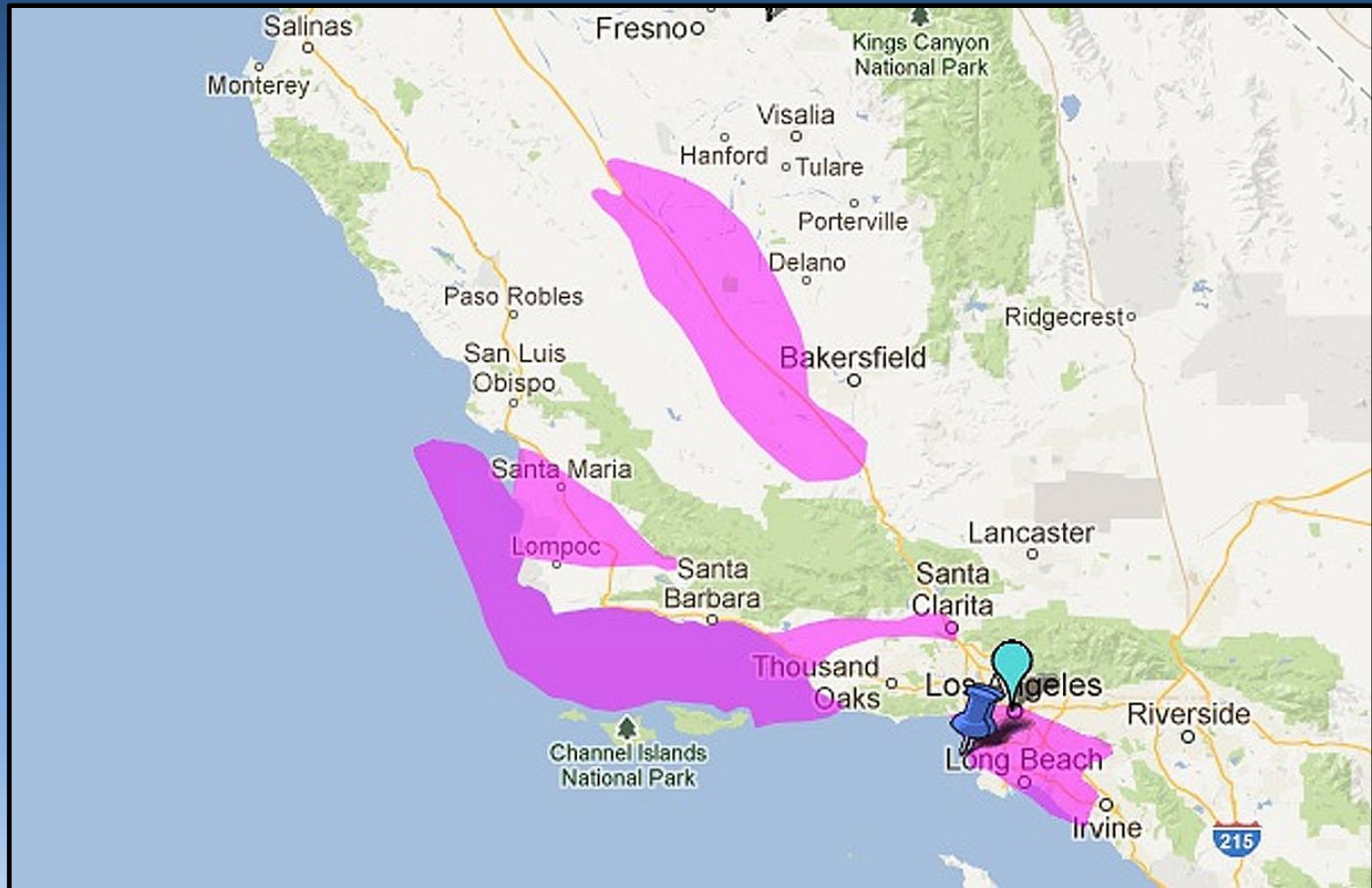


Source: <http://energyinnovation.org>



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# The Monterey Shale?

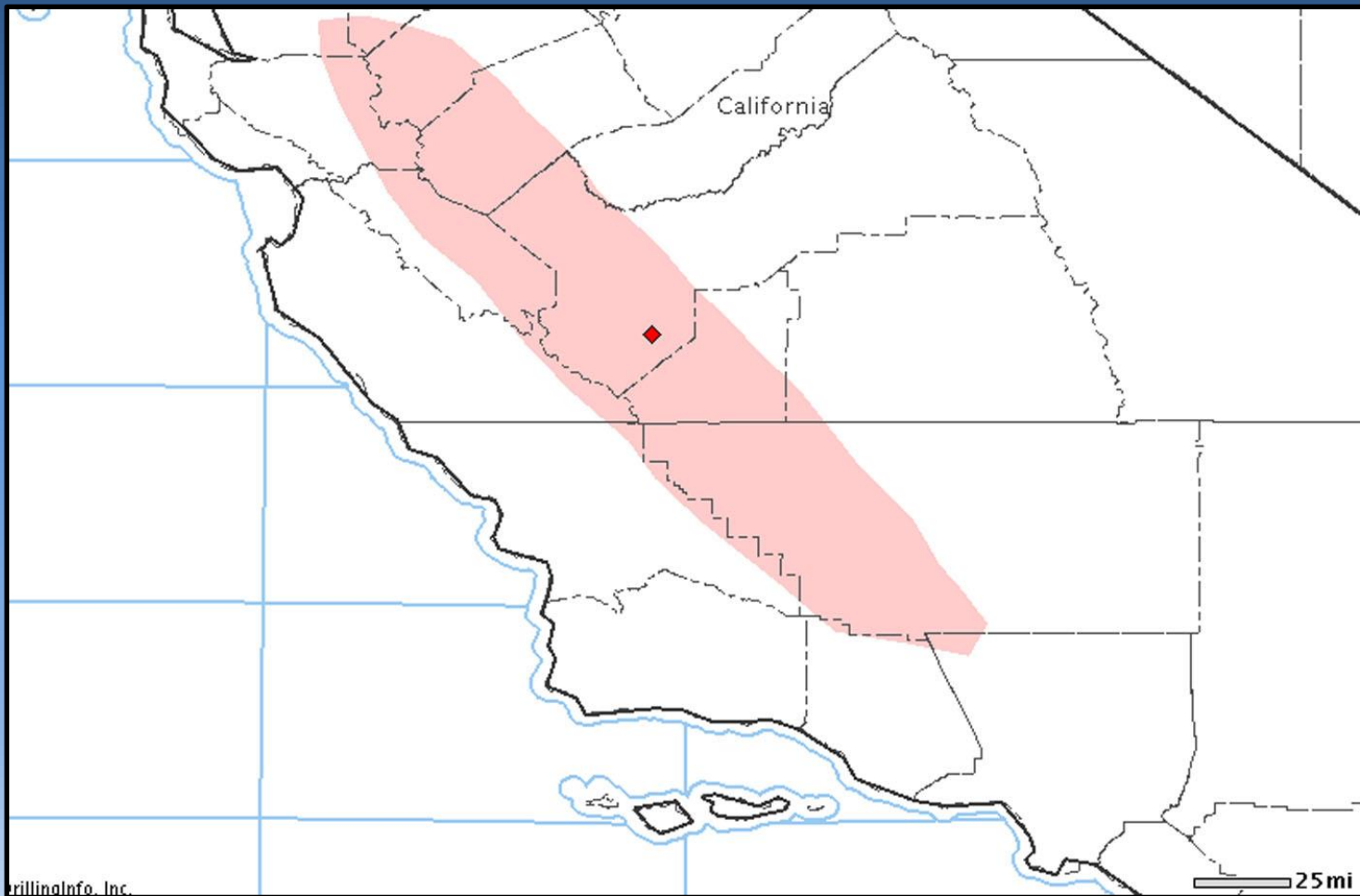


Source: <http://www.indybay.org>



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# The Monterey Shale?



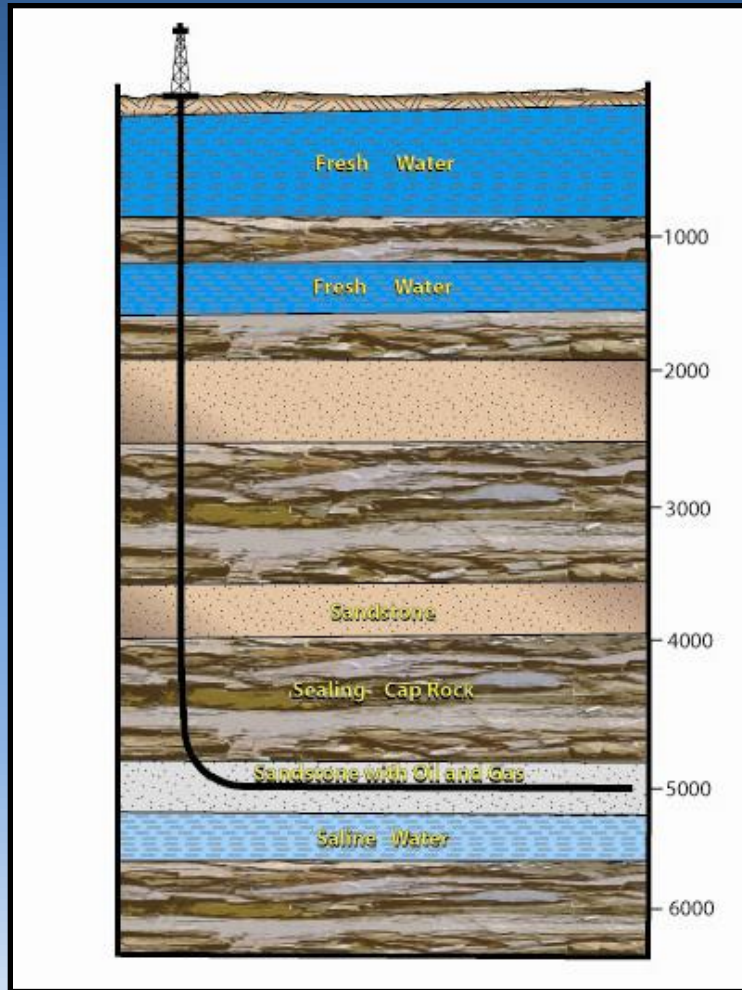
Source: <http://info.drillinginfo.com>



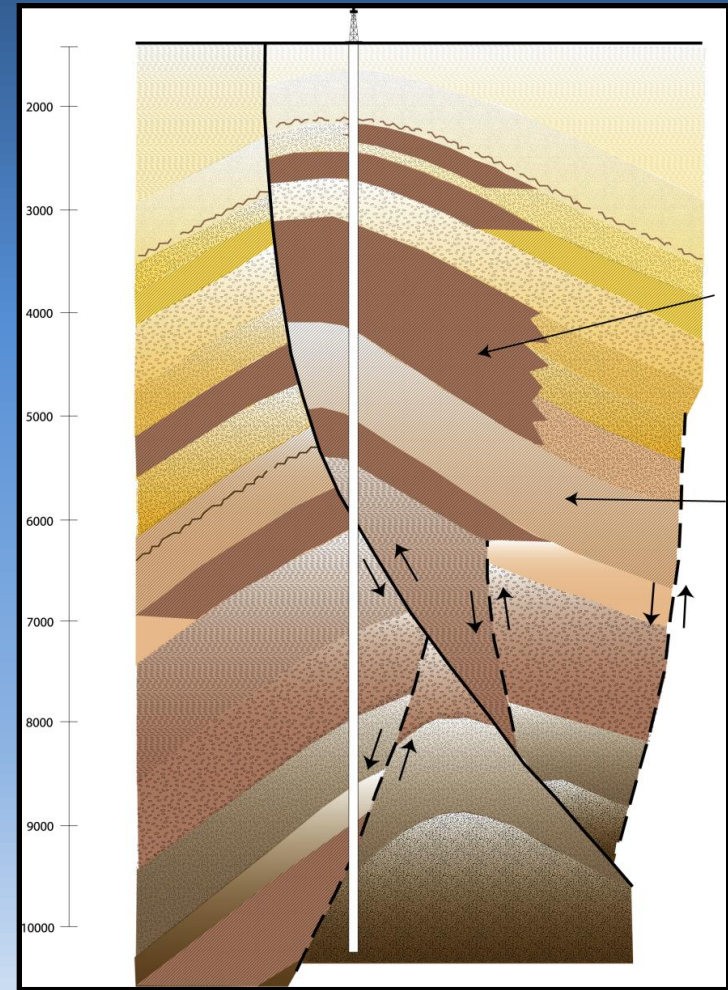
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# Geology of Oil and Gas Deposits



Source: CA Dept of Conservation



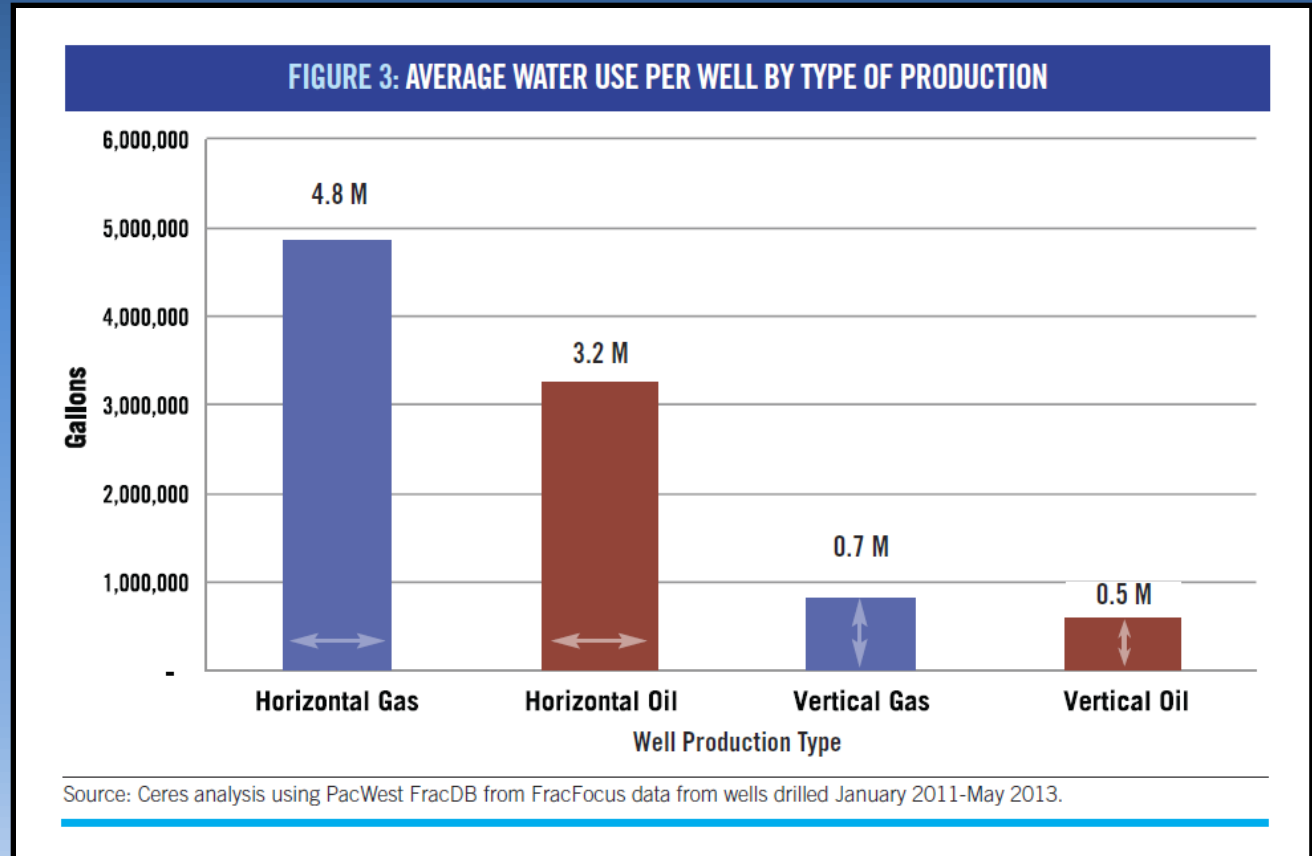
Source: CA Dept of Conservation



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# Water Use in Hydraulic Fracturing

- Nat'l water use for HF in 2014
- CA avg. water use per HF  $\approx$  160,000 gallons
- Total CA water use all HF in 2013  $\approx$  300 acre feet

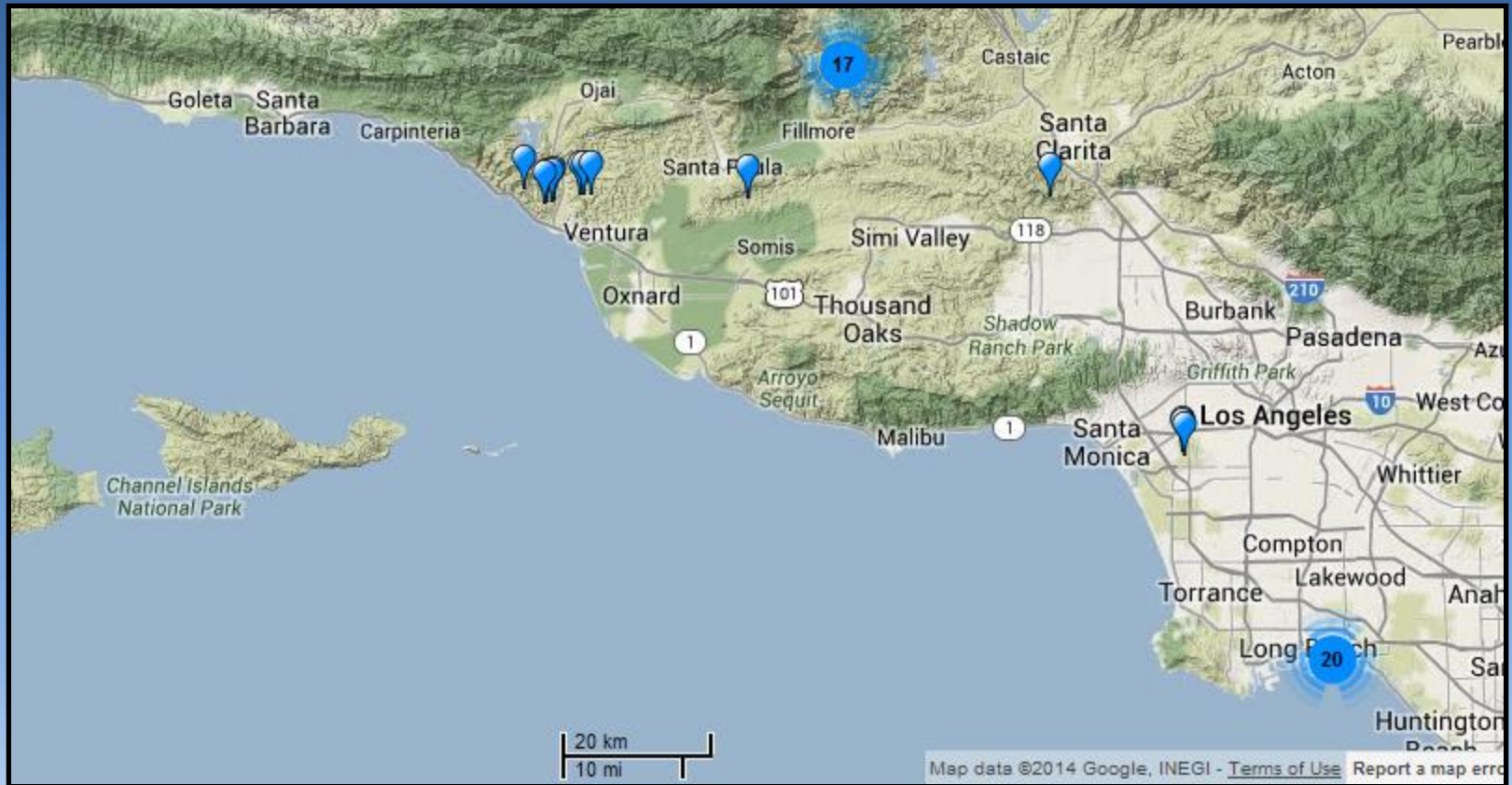


Source: "Hydraulic Fracturing & Water Stress: Water Demand by the Numbers"  
[www.ceres.org](http://www.ceres.org), Boston, MA, Feb. 2014



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# Hydraulic Fracturing in Recent Past



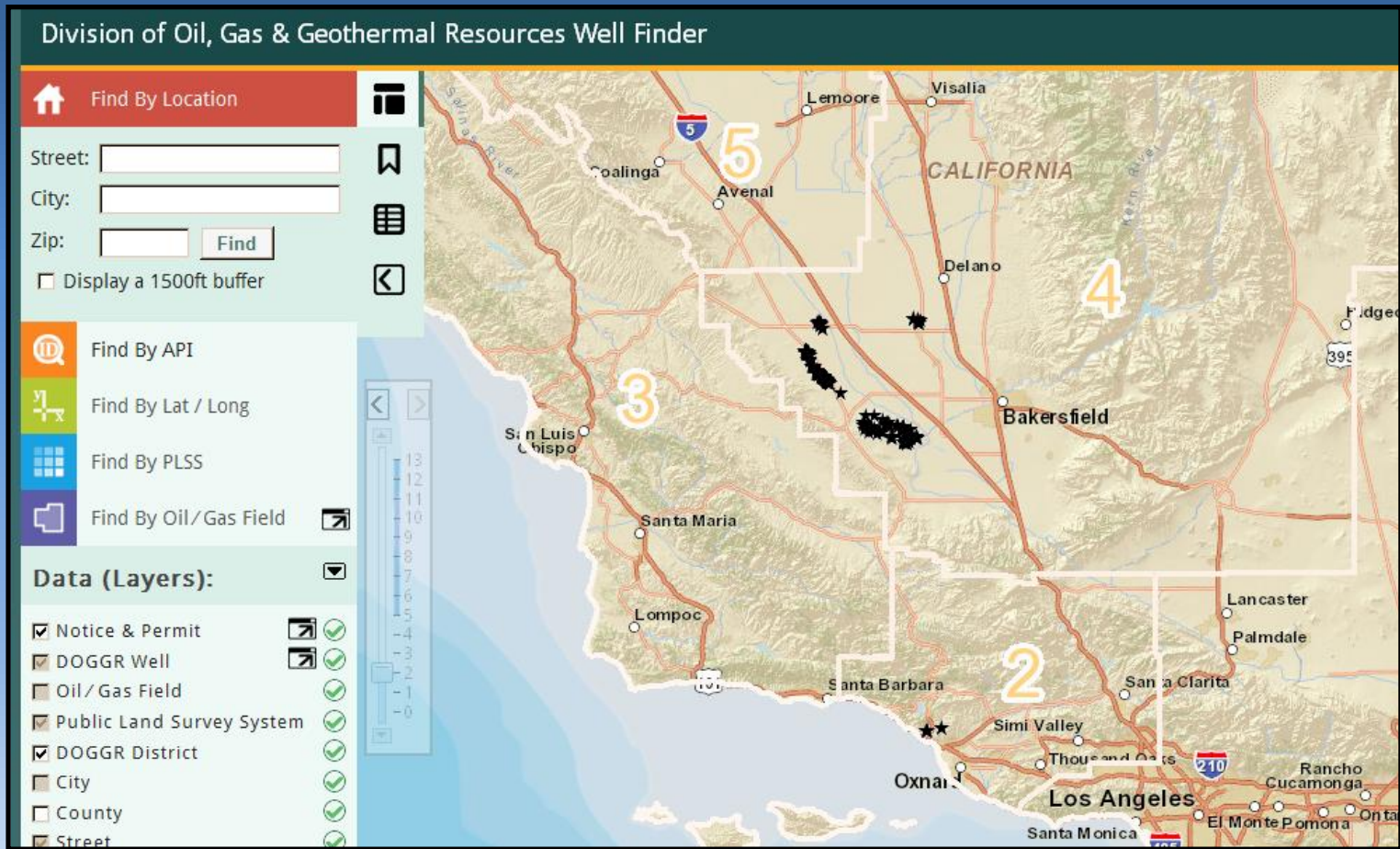
Source: [www.fracfocus.org](http://www.fracfocus.org)



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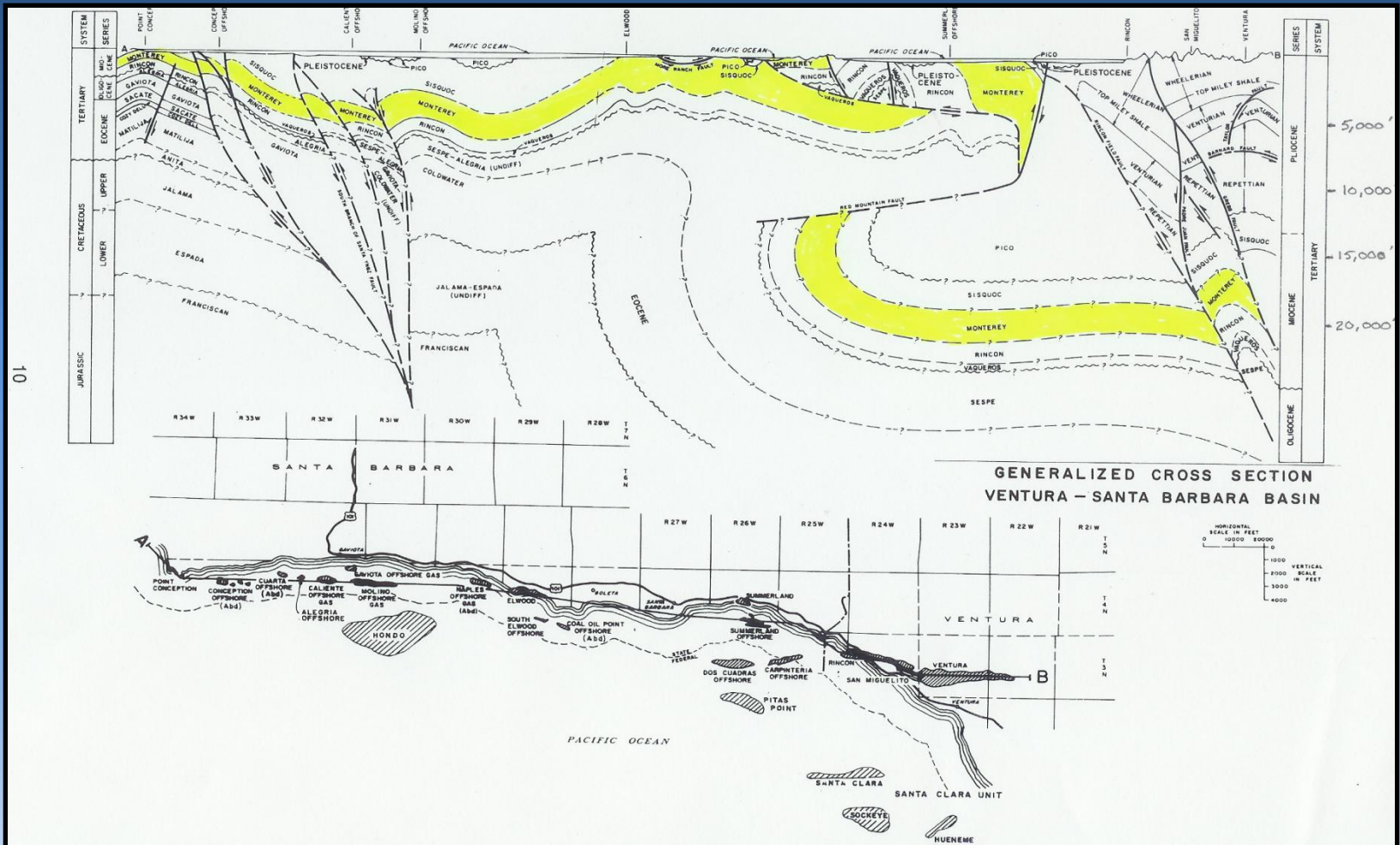
# Hydraulic Fracturing -- Last 2 months



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# Offshore / Onshore Geology



Source: CA Dept of Conservation



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# Historic Regulation

- Well Construction Standards
  - Focus on competent well bores
  - Ensure “zonal isolation”
- Facilities regulation
  - Covers pipelines, collection/separation vessels / tanks
  - Includes Spill Prevention and Contingency Planning



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# Senate Bill 4

## Permanent Regulations

- Will require:
  - Permit from DOGGR
  - Neighbor notification
  - Pre-WST evaluation of formation & well
  - Monitoring during and after WST
  - Water quality monitoring plans and water management plans
  - Public disclosure of job and chemicals used
- Process for adoption



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# Senate Bill 4

## Interim Regulations

- **Now** require:
  - Neighbor notification
  - Pre-WST pressure testing of well and surface equipment
  - Water quality monitoring plans
  - Disclosure of HF fluid content
  - Public disclosure



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# Senate Bill 4

## “Well Stimulation” EIR and Independent Scientific Study

- EIR
  - WST as a “project”
  - Process for EIR
- Independent Study
  - Procurement near complete
  - SB 4 direction and scope of study



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# Conclusion



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